DOCUMENT RESUME

ED 246 457 CS 208 486

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TITLE Matching Spelling to Human Abilities--A Review.
PUB DATE 16 May 84
NOTE 30p.; The 1984 Mont Follick lecture presented in the Department of Linguistics, University of Manchester (Manchester, England, May 16, 1984).
PUB TYPE Viewpoints (120) -- Speeches/Conference Papers (150)

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Communication (Thought Transfer); *Contrastive Linguistics; Individual Needs; Information Science; Intercultural Communication; *Language Research; Learning Theories; Letters (Alphabet); *Literacy; *Orthographic Symbols; *Reading Ability; Research Needs; *Spelling

ABSTRACT

Spelling, a basic component of information technology, has been investigated for its efficiency as a means of communication, with some researchers claiming that English spelling is close to ideal for really literate people to read fast and efficiently. Evidence about human abilities to obtain meaning from the printed word has come from studies of how beginners tend to spell, lists of the most common spelling errors, trends in popular choice of spelling, international vocabularies, and educational research. In reading, literate adults switch spelling sets automatically according to changes in the medium--print or handwriting, upper or lower case, and if bilingual, different sets of sound-symbol relationships. Studies have explored a variety of hypotheses about how present spelling might be made more accessible to a wider range of users. For example, experiments in surplus spelling have explored the notion of identifying and removing "clutter" in words--finding by experiment the letters that are not missed and that serve no purpose. Investigations have also revealed how few algorithms might be sufficient to modify present English spelling without effectively disguising it; only a few consistent rules might be needed to show morphemes and grammatical markers more clearly, while enhancing accurate phonological representation at the same time. Such studies can help to determine the "optimum" features of an orthography to match a particular language and suit the varied needs and abilities of its users. (HOD)

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ABSTRACT

Spelling considered as a basic component of information technology can be investigated for its efficiency as a means of communication. An overview is given of the types of research that exist and can be developed, to determine the "optimum" features of an orthography to match a particular language and suit the varied needs and abilities of its users. Relevant areas are behavioral studies of spelling behavior and trends; experimental research in education, cognitive psychology and computer algorithms; and cross-cultural studies of orthographies, including recent creations and reforms. Theoretical issues and some research directions are outlined.

The short reference list is illustrative only. Some topics already have an extensive literature, while others are still relatively unexplored.

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The 1984 Mont Follick lecture, presented in the Department of Linguistics, University of Manchester, U.K. 16 May 1984

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CS 208 486

June 1984

MATCHING SPELLING TO HUMAN ABILITIES -- A REVIEW

Universal compulsory education has been based on the premise that universal literacy is both desirable and possible. English spelling for reading and writing is transmitted as an aspect of our culture.

Spelling can also be considered as technology, and it can be investigated for its efficiency as a means of communication. It just happens that it was invented a long time ago, and that telephones and computer languages are only recent. Scientific technology assumes that everything is open to further improvement. One of its most important principles is human engineering - that is, that technology must be fitted to the needs and abilities of its users. The word for this is user-friendly. One of the weakest points of modern communications technology is English spelling. Is there any evidence that it could be user-friendly?

A second constraint operates in technology once any product becomes established. Unless new developments are quite revolutionary, they must mesh in with what exists already. The word for this continuity is backwards compatibility. It is not impossible that some day some invention may revolutionise the way that language can be permanently recorded in visible form - some technique that can cross international barriers of spoken languages, like Chinese but without its disadvantages, and a new ball game for everyone to play the world over. Until that time, a condition for the improvement of spelling specifically for the English language must be a benefit for those already literate. Matching spelling to human abilities must include human ability to adapt to spelling change - that is, to switch set from one spelling mode to another.

In this paper, some crucial issues will be left aside - such as the relation of spelling to other features of the writing system, and the non-cognitive aspects of spelling in our culture - the emotional, social, philosophical and politic-economic factors which affect how and whether people actually use their potential abilities to read. The discussion will focus on the human needs that an orthography must meet, sources of evidence for human abilities in spelling, the state of what we think we know and what we need to know about the design of spelling to be tailor-made for the English language, and possible directions for research and development. This is a glimpse and overview of a wide and complex subject, and the references cited are given as illustrations of work on particular aspects.

Criteria for an efficient orthographic system

It is widely believed that it would be impossible to have a spelling that met everyone's needs, although so far this claim and its assumptions have only been briefly investigated (e.g. Frith 1980). The claim goes that English spelling is close to ideal for really literate people to read fast and efficiently. Goodman (1968) has described reading in English as a psycholinguistic guessing game, since it is a mixture of coding systems that operate on many different levels rather inconsistently. Levels of representation can be illustrated by some of the functions of 'silent' final -e (as given by Smith ,1980):

GRAPHEMIC: as in freeze - to show it is not a foreign import
GRAPHEMIC/PHONEMIC: as in little, as a rule when syllabic liquids are preceded by a consonant.
PHONEMIC: as in mate or ice, to modify a preceding vowel or soften c.
PHONOLOGICAL: as in arabesque to predict a syllable with primary stress.
LEXICAL: to distinguish some homophones, or distinguish from plurals, as in or/ore, raise/rays
ETYMOLOGICAL: to show early Latin or French derivation, as in primate.

It is thought that good readers can benefit from all these levels because they have the ability to switch around automatically as they read, to cue in whatever is most useful as they go, operating the various codes like jugglers, although their basic operation is usually taken to be visual recognition of what has become familiar to the eye, allowing direct reading for meaning.

It has been claimed that it would be more difficult for skilled readers to read so fast and efficiently for meaning if the spelling were made simple and logical enough for learners to learn it easily, or if it represented the spoken language accurately enough for foreigners and immigrants to learn English easily, or if it was consistent and snappy enough for writers and typists to spell easily, or if it could be programmed logically by a computer without the need for a plugged-in dictionary, or if it was straightforward enough for the average adult population to read with more ease and fluency than it does now.

So, with these differing needs in mind, if English spelling were to be matched to human abilities - whose abilities are we speaking about? (If it is the needs of the majority that are the most important, the fact is that the majority of users of the English language today are not native-speakers, and this international majority is increasing its proportion by millions annually.)

Sources of evidence about human abilities to obtain meaning from the printed word come from observation around us and from the findings of experimental research. In recent decades, promising areas of research have opened up, although many critical experiments and surveys remain to be defined and carried out.

Behavioural studies are beginning to attend to trends and tendencies which show how people would like to spell, for reading and writing. Languages show trends and changes - what is the natural drift of spelling tendencies today? Sources of evidence include:-

i) Studies of how beginners tend to spell 'naturally' at first - taking a slightly different slant from Chomsky (1977). *

ii) Adult understanding of spelling principles -e.g. Secrist (1976) nd Baker (1980)

iii) The most common spelling errors, as listed in 'Awful Spellers' Handbooks', and which you might think that dictionaries could be more willing to recognise, as how people actually do spell.

iv) The sort of spelling slips that highly literate writers can make under stress, e.g. in Cambridge examination (Wing and Baddeley 1980), which do not come into sequencing categories.

v) Trends in popular choice of spelling when dictionaries do offer alternatives - e.g. gaol/jail, silvan/sylvan, taboo/tabu, lacquey/lackey, develop/develope, phrenzy/frenzy, fetiche/fetish, grey/gray, doughnut/donut. Once people felt safer if they used the more difficult spelling, to emphasise how educated they were, but today the more regular and shorter spellings tend to be preferred, as the value has changed to efficiency.

vi) Trends in spelling of newly invented words, and modern imports from abroad. New words derived from classical roots are less likely to use silent letters and consonant digraphs.

vi) The phenomenon of 'advertising spelling'.(Jaquith 1976, Mazurkiewicz 1983) One aim of novel spellings in commerce is to arouse attention, but businesses can also not afford to offend mass sensibilities. Advertising spelling is also deliberately designed to be readable by

* e.g. "Tom drov too thu epot bicos he wontid a cach a plan the plan mad a fosd ladig." by a five-year-old. ("Tom drove to the airport because he wanted to catch a plane. The plane made a forced landing.")

the widest possible public, which includes the vast numbers of the semi-literate, and it is also designed to be eminently readable in the first glance at a supermarket shelf. We have already in effect what has been called 'digraphia' (Jaquith) in English spelling already, with recognizable principles of its own. The fact that we can read it without difficulty, even if with affront, shows something of human ability to switch spelling set.

vi) International spelling of 'international' vocabulary can also be observed as this phenomenon increases. From pidgin to Franglais, there is a growing anecdotal literature to be collated.

vii) The requirements of computers change as technology advances, but it is still necessary to consider the degree to which they might be programmed without dictionaries to spell in English for transliteration of speech and print by machine.

viii) There are also complementary phenomena. One is the possibility of reducing homograph problems by preference for alternative vocabulary, although this is nullified by the increasing tendency to increase the multiple meanings of words rather than to invent new words for new concepts. The second tack is pronunciation spelling, the way in which the pronunciation of many words is coming closer to their spelling, regardless of the 'in-groups' who have had in effect some degree of private monopoly of 'correctness'. Nobody should laugh at those who do not know any better than to pronounce shindig as shindig, or schism as schism - not only because they may be Australians, but also in view of Johnson's dictum: "In pronunciation, the best general rule is to consider those as the most elegant speakers who deviate least from the written word." (see, for example, Kerek, 1975)

vii) Until recently, most educational research on spelling was concerned mainly with either the nature of the present spelling system, or what is wrong with those who fail to learn it. As there are vast volumes of this, much of it could be re-analysed from the angle of what sort of spelling could these unfortunates learn.

viii) Experimental research has conventionally tested students or 'dyslexics' - that is, not ordinary people. Laboratory research on spelling is usually with single words only, since these are most manageable. The need now is to move into aspects that are really difficult to test with precise measurements - how people process

spelling when they are reading continuous text, as in books or newspapers.

ix) A further problem is that current theories about cognitive processes in reading and spelling tend to be rather parochial, because they are based almost entirely on work with the English spelling system, and they reflect the assumption that whatever is needed to be able to use the English spelling system will be universally needed for all other orthographies too. That this is not necessarily true is becoming apparent in cross-cultural studies of orthographies, an area of research that has become more important since the 1960s, although it is still bugged by the difficulties of establishing comparative measures, since languages themselves vary so much, as well as educational and social conditions. (see for example, Downing, 1973, Kavanagh and Venezky, 1980.)

For example, it is possible that orthographic units of syllables might be easier to learn and use than units of phonemes. One factor in the high rate of Japanese literacy (claimed by Machito to be in the region of 99%) is certainly diligence, but it may also be that at the most critical and difficult point in learning to read - cottoning on to what print is about anyway - Japanese children start with a very simple system of symbols for whole syllables, hiragana. However, this is only effective because the Japanese language is made up of a limited number of syllables; it would not be feasible for English, which has hundreds, if not thousands. (Sakamoto, 1980, Morton and Sasanuma, 1984.)

Around the world, different writing systems provide natural laboratories. There are orthographies in which the basic unit is the phoneme, or the syllable, or the whole word, or combinations of various forms, (see Haas, 1983). Sometimes the writing system seems to fit the characteristics of the language, and sometimes it does not. (See Stevenson et al,1982 for some interesting comparisons of learning problems.)

We can observe living experiments in the dozens of new spellings invented in the past century for previously illiterate societies - often by Britons and Americans. (Grimes,1980, O'Halloran, 1980,Smalley 1964, Pitman and St.John,1969.)

Few English speakers are aware that in the past hundred years every major language except English and French has been involved in some sort

of spelling reform, varying from minimal to drastic. We can observe what has happened with the differing types of change, and their different methods of implementation, and the consequences - but to my knowledge there has been no major work yet on this subject.

There is much to find out, but some generalisations can be safely made. There is one curious fact. English spelling reformers and anti-reformers alike have always assumed that the only way ahead for spelling improvement is to go back, to the original alphabetical principle of pure sound-symbol correspondence. However, it is noteworthy that, over the world, comparatively few alphabetic spellings are purely phonemic in practice. There are usually some modifications - sometimes for historical reasons and with perverse results, but sometimes because the modifications make the spelling more practicable in real life. The ideal in theory may not be ideal in practice - rather like the metric system, so theoretically perfect, but with units of measurement that are troublesome for housekeepers, builders, and weighers of babies. (Some experimental perspectives on the difference between what you may expect and what you may find are to be found in, for example, Kavanagh and Mattingley, 1972, Kolers, Wrolstadt and Bouma, 1970, and Kolers, 1979.)

And so even recently-invented orthographies with basically phonemic spellings have had practical modifications brought in too - sometimes to streamline their representation of phonemes to be less clumsy, or to bring in semantic or grammatical markers, or even because it helps to have a spelling closer in line with neighbouring languages, however different the linguistic system may be.

We may even be more shaken in our notions of the divine mystique of spelling systems when we see how curious it is that so many writing systems manage to find some way of being unnecessarily difficult - although English spelling remains among the world-beaters for its unpredictability. Finnish spelling, for example, is usually held up as a model of a pure phonemic spelling, with sound matching symbol (Kyöstiö, 1980) but learners have big problems because there are some very difficult auditory discriminations to make, and words tend to be long - often around seven syllables. "syötettäviämmehän", for example. And other things being equal, the longer the word, the harder it is to learn to read or spell. (Doggett and Richards, 1975)

Cross-cultural observation also shows the capacity of some people to decode anything at all - they are cipher wizards. And sometimes, when the culture of the elite is too difficult, the masses resort to another for their own communication. For example, the classically-based modern Greek language for the educated Greek now competes with demotic Greek for the ordinary people. In Korea, while the educated continued to read in Sino-Japanese logographs, the poorly-educated and the foreigners were taking up the alphabetic hangul, which since the war has first infiltrated and now almost completely replaced logographic script in a painless and cost-free transition.

There are beginners' spellings that are then streamlined for adults, and there are beginners' spellings that are then made more complex for adults - as in Hebrew orthography on the one hand, and Japanese and the IBM-supported American literacy scheme of John Henry Martin on the other. (Navon and Shimron, 1984. Downing, 1977, for i.t.a.)

Ideally, if measures from cross-cultural research could be equalised, it might be possible to estimate literacy ceilings for the different types of orthography-language matching that exist or are possible. That is, we might discover what match of language and orthographic system made possible the highest degree of mass literacy with minimum investment, and also what was the highest degree of efficiency in reading and writing that the most literate sections of a population could hope to attain. Our standards and expectations at present may be lower than we think.

Our own experience in learning other languages, and multi-lingualism in general, can teach us much about the possible flexibility of our capacity to read different spellings once we have mastered the hardest thing - learning the first time around. This switching can be exemplified in Serbo-Croatian readers, who have a language with three dialects and two alphabets. The fully literate can read in both the roman and cyrillic alphabets, switching spelling-set automatically, although their design might seem intended to confuse - each alphabet has 16 unique letters, shares seven letters with the same sound referents, then shares seven more letters which each pronounces differently. (Turvey, Feldman and Lukatela, 1984)

Once a person can read in one language, switching spelling set to master another is possible, even if symbols have different phonological referents, and particularly easy if the new spelling is rule-based. Accent and intonation apart, an English-speaker can read Indonesian

spelling after ten minutes study, Italian after twenty, and German after half an hour -although before they can follow English spelling accurately, other nationals need a dictionary and several years' work. The rules for Italian spelling fit on under a quarto page; a complete English spelling book needs around 168 pages.

In reading, literate adults switch set automatically to changes in the medium - print or handwriting, upper or lower case, and if bilingual, to different sets of sound-symbol relationships. We can experiment in how readers can switch set to reading English in different spelling modes too, as well as different types of mutilated text. (e.g. Strange, 1979.) If the spelling system were improved, could we read faster or more efficiently than we do now? Is it true that the Japanese outpace us?

Beech (1980) found that when some of the most common English spelling 'rules' were applied consistently to produce a 'regular' spelling, subjects regained normal reading speed within 2½ hours practice. A pure phonemic spelling was more difficult, although here too, speeds improved with practice. Emotional attitudes to spelling change can also be monitored, as they first lag behind, and then catch up with objectively-measured skills in reading the unfamiliar. I have found that it can take less than twenty minutes for readers to acclimatise to a spelling in which there have been no letter substitutions, but omission of letters which are 'surplus' for meaning or pronunciation. The criterion that demonstrates which letters in words are really a nuisance is experimental findings of improved efficiency, once some visual familiarity is established.

Theoretical issues

Speculation about 'optimum' spelling can be derived from existing theories and evidence, but still needs a solid backing of research to test arguments. Some of the most important theoretical issues will be mentioned - but only briefly, since any discussion here could only be oversimplification.

A neuropsychological model of reading is important to settle arguments and assumptions about the roles of phonology, visual recognition, and symbols that provide direct access to meaning. How far do our brains operate like a computer model, with an organized mental lexicon, and input and output via visual, auditory and semantic channels which have sequential operations and can be described by flow-charts? Or is a

holistic organic model more likely, with concepts of degrees of intensity of signals within orthographic space, nonspecific integration of incoming sensory modes, and search processes by network and focussing? (e.g. Morton, 1980, Henderson, 1982, 1984, Henderson and Chard, 1980, Kolers, Wrolstadt and Bouma, 1979, Coltheart, Patterson and Marshall, 1980, Marshall, 1976.)

A really useful spelling should accommodate to both the clever and the dull. It may also need to be suitable for different types of user, if, as Baron et al suggest (1980) there may be intrinsic differences in the way individuals process text, with some who may be 'Phoenician' types, congenitally more adept at phonology and alphabets, and others may be 'Chinese', more suited to visual methods and logographs.

There is still controversy about whether a skilled reader of English abandons all phonological decoding except for emergencies, or finds it most helpful to read with continued vestigial processing in all modalities to the point needed to identify meaning as he skims along the page. (See for example, Barron, 1980, Strange, 1979, Bradshaw 1975.)

English spelling is full of redundancy, as well as some misinformation - redundancy in the sense that more letter information may be provided than the minimum required to work out a word - as in <u>cheese</u> and <u>dull</u> - not only in the sense that the skilled reader has multiple information to predict what may come next, through probabilities of letter sequence. Now redundancy as repeated information about meaning in speech or writing may be an advantage to ensure that a point is taken and not missed - but could redundancy in the sense of extra letters in spelling be just a clutter, a hindrance rather than a help? It may be a contrast to the definition of orthographic structure as the statistical redundancy of letters and rule-governed regularity. (Massaro and Taylor's definition, 1980 - a different perspective from Sampson, 1981.)

One of the most significant factors in word recognition is familiarity - the word-frequency effect is fully established. Where does that leave the visual distinctiveness hypothesis, which claims that it is a great advantage to have a great variety of visual forms - many of them relatively unfamiliar? (Sampson, op.cit.)

How far is learning to read the visual letter-strings of

English words really like learning to recognise the more compact gestalts of logos or Chinese symbols? (c.f. Ehri, 1980 on the development of orthographic images.) Children are still being plagued by the 'Look and Say' method which tries to teach reading by immediate recognition of whole words or even sentences - despite the accumulated evidence that while twenty to forty words may be learnt this way without undue confusion, beyond this, learners must know how and what to remember to distinguish and identify as elements. (See Feitelson, 1980, for an illuminating account of the Israeli experience. The research of Bradley and BRyant, 1983, is also relevant to this point.)

A pure phonic method to learn to read may be simple and effective for a fairly consistently phonemic spelling. Mass literacy can be taught in Hispanic countries by the method of Paulo Freire. An illiterate peasant, taught twenty words of psychological significance to him, that contain all the symbols and phonemes of the language, may then practice how to read or write anything himself, by recombining those symbols. This technique would be impossible for English, however, because although there are only 26 letters and 40-45 phonemes, more than 600 ways have been shown by which the letters can represent the phonemes. However, it would be possible for a rule-based English spelling, either phonemic, or a regularising of present morpho-phonemic principles, to be taught in this way.

Nevertheless, a pure phonic approach may not be ideal for young beginners, since developmentally most of them are still not very good at precision in auditory analysis, although they may manage in a broad-band elliptical sort of way.

A basic flaw is that both visual and phonic teaching methods have really relied on rote-learning. What about children's minds? Children learn the spoken language not only by repetition, but through the remarkable ability to generalise linguistic principles by intuitive logical analogy, although they cannot verbalise or abstract them consciously. Observe how much time is spent in elementary school on exercises to teach the irregular aspects of English grammar, or in other ways helping children to unlearn, for example,

I bringed, I singed, I winged, I flinged and substitute
I brought, I sang, I winged, I flung.

If children's natural linguistic abilities could be turned to advantage in learning a consistent, rule-based spelling, they might be able to operate it to practise reading anything independently very early, without being limited to highly contrived reading schemes or 'getting words from teacher' at every step.

Directions for research

A variety of hypotheses could be explored about how present spelling might be made more accessible to a wider range of users. I would like to discuss two of them.

Experiments in surplus spelling explore the notion of identifying and removing 'clutter' in words - finding by experiment the letters that are not missed, and that serve no purpose. The line of thinking here is that a basic spelling structure is more important than variety of visual distinctiveness, for both readers and learners. This is rather like Chomsky's idea (1968, C.Chomsky 1970) of a deep structure to spelling that underlies surface phonological variation, but here I am thinking about a deep structure that underlies surface visual messing around. Pilot experiments suggest that letter-omission of letters superfluous to phonology or meaning is least often noticed by good readers when dropped from polysyllables, towards the end of words, and when double letters have no function to show syllable stress or vowel pronunciation. Poor readers and good readers are more likely to improve reading speed and/or accuracy when omitted letters are phonologically misleading, but 'average' readers may be temporarily set back by visual unfamiliarity. Visual acclimatisation occurs rapidly. Omissions in very common 'irregular' words can be more disturbing than omissions from words that are 'regular' apart from the omitted letter/s. At a certain point in the proportion of letters omitted (one to five per cent or more) subjects recognise a qualitative change of 'spelling mode', with the characteristics of a consistent style, so that deviations from this streamlined consistency appear noticeable and awkward.

Dropping letters arouses less offence than changing them, and makes minimum disturbance to present spelling. This sort of stripping could conceivably be the first stage in a two-stage improvement of English spelling.

All the claims that are made for the advantages of present spelling should now be thoroughly investigated, so that proven advantages can be

maximised - for at present English spelling is indeed haphazard in the application of most of its principles. (c.f. Wijk, 1966, Kolers, 1980)

It is necessary to know whether grammatical markers are really useful, and to establish whether etymology has any value outside dictionaries. (Yule 1980,1980) If Chomsky's claim was taken seriously - which is basically that spelling represents units of meaning, morphemes - could the idea be applied consistently? (For a summary of critiques of Chomsky, see Downing and Leong, 1982, and a quantitative test in Yule, 1978.)

A syllabic spelling suits the Japanese language - a morphemic spelling might very well suit the English language. (A sidelight on this comes from Eisenberg and Becker, 1982, for example.) Could literate readers then read more directly for meaning? There might be an advantage for both readers and learners in the fact that there would be more visual repetition of the same units of meaning across related words - thus increasing the frequency effect and aiding the parsing of polysyllables. Learners, foreigners as well as children, might identify the meaning in context of much new vocabulary more easily, and so extend their knowledge of English language through reading in a way that enabled them to speak as well as write the vocabulary that they can comprehend on paper.

Investigation could reveal how few algorithms might be sufficient to modify present English spelling without effectively disguising it; only a few consistent rules might be needed to show morphemes and grammatical markers more clearly, while enhancing accurate phonological representation at the same time -e.g. a consistent use of 'silent e' as a modifier of preceding vowels or distinguishing final /s/ in a word stem from final /s) as a grammatical affix. Learners can cope with a limited number of very common irregular 'sight words' presented as such, and to keep about fifteen of these would also go a long way to maintaining continuity with the present appearance of English text on the page.

Such a spelling might be well suited to the developmental stage of children when reading instruction is begun, because it takes account of their level of cognitive reasoning and language abilties, and what is known about what they can and cannot do easily by way of sound-symbol linking and idenfification. (See e.g. Thackray,1980, on the effects of a consistent spelling on children's readiness to read.)

Some situations might be especially suited for testing these types of spelling change, so that the final verdict was by public preference when, as in dictionaries, alternative spellings co-exist:-

i) As initial learning spelling, which enables immediate transition to present spelling - as in the J.H.Martin 'Writing to Read' scheme, but with greater attention to matching the pedagogy to the learning medium.

ii) As an aid to backward readers, to help them read independently in present spelling, and develop a sense of spelling structure.

iii) As a demotic spelling in its own right for the communication to and among semi-literate minority groups.

iv) To test out as an aid or improvement for international English. (It could well be that the Japanese might be first with an improved international English spelling, for commercial reasons.)

v) As pronunciation keys in dictionaries, especially for children who cannot follow phonetic systems, and as a consequence usually have no pronunciation given for words in children's dictionaries.

vi) Dictionaries can begin to consider the possibility of increasing the range of alternative spellings they accept, according to public usage that follows consistent patterns.

vii) Where speedy recognition and spatial economy are important, as on electronic screens, microfiche and roadway signs, surplus-cut spelling might soon prove its worth.

Conclusion

Television can do many things much better than books, but we are only beginning to realise that the audio-visual media still cannot transmit many of the most important components of a civilisation. In the present literacy crisis, we may become more willing to try to match English spelling to the abilities of a bigger section of our own population and the world at large.

Even a simple step of omitting interfering letters, if proven to be interfering, might seem too trivial -but could have the social significance of the traditional ha-porth of tar and horse-shoe nail, while being costless to introduce, and rendering nothing obsolete. Surplus letters can be the little barbed wire or small booby-trap in the garden, that can wreck learners' confidence in 'the system' and themselves.

It might be possible to make English spelling psycholinguistic, but not a guessing game. (See, for example, Spiro, Bruce and Brewer, 1980, for indirect, but relevant discussion.) Spelling might maximise all the avenues to reading that were found useful, and consistently represent its own structural principles insofar as anything in reality can do so. Unfamiliarity is only an introductory hurdle, which investigation into switching spelling set may cut down to size; novelty may soon be taken for granted if it is useful, and could provide a 'best fit' for the wide range of needs and abilities of different types of learners and users.

If spelling can take its place among the new technology, then fuller advantage could be taken of the educational possibilities of the rest of our new communications technology. Rather than supplanting books, it could fulfil its presently limited potential to make the teaching of literacy more cost-effective in terms of human waste as well as money.

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MATCHING SPELLING TO HUMAN ABILITIES

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